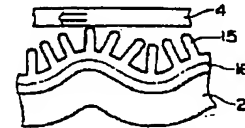
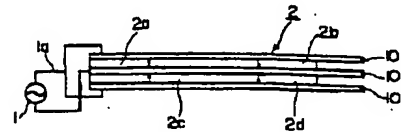


**(54) METHOD OF DRIVING ULTRASONIC ACTUATOR**

(11) 5-146175 (A) (43) 11.6.1993 (19) JP  
 (21) Appl. No. 3-304907 (22) 20.11.1991  
 (71) JAPAN STEEL WORKS LTD:THE (72) TOKUJI HAYASHI(1)  
 (51) Int. Cl<sup>8</sup>. H02N2/00

**PURPOSE:** To shift a mover, which contacts with comb teeth, by generating creeping motion in the comb teeth of an elastic body by the progressive wave by the composition of the standing waves generated by a vibrator and the reflected wave generated from one end of the vibrator.

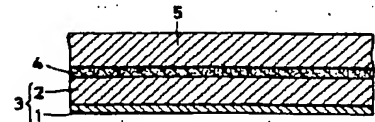
**CONSTITUTION:** An oscillator 2 is composed of each oscillation plate 2a-2d and each electrode 10, and an elastic body 16, which has many comb teeth 15, is provided on the topside of the oscillator 2. The oscillator 2 is supplied with driving signals 1a, and when the standing wave generated by the oscillator 2 is reflected from one end of the oscillator 2, and the first reflected wave occurs, the first composite wave occurs on an elastic body 16 by the composition of the standing wave and the first reflected wave. Next, the first composite wave on the elastic body 16 reflects at one end of the elastic body 16 thereby causing the second reflected wave; and the second reflected wave is composed with the first composite wave, which generates the second composite wave. This second composite wave is shifted in phase temporally from the first composite wave. Accordingly, in one point of each composite wave, the oscillation of the elastic body 16 becomes a progressive wave, which goes with time, and the comb teeth 15 performs the peristaltic motion, and a mover 4 moves.

**(54) ULTRASONIC MOTOR**

(11) 5-146176 (A) (43) 11.6.1993 (19) JP  
 (21) Appl. No. 3-308977 (22) 25.11.1991  
 (71) NTN CORP (72) NOBORU UMEMOTO  
 (51) Int. Cl<sup>8</sup>. H02N2/00

**PURPOSE:** To provide an ultrasonic motor where the driving property does not change even if it is driven extending for a long time.

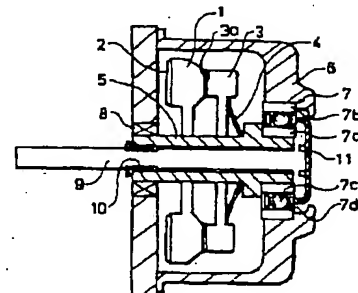
**CONSTITUTION:** An ultrasonic motor is composed of an oscillator 3, wherein an elastic body 2 is stacked on an oscillating piezoelectric body 1, and a mover 15, which is in pressure-contact with this oscillator 3 through the frictional member 4 made by thermosetting resin containing calcium carbonate. The thermosetting resin may be one or more kinds of thermosetting resin being selected from ethylene tetrafluoride resin, aromatic polyester ketone resin, and polyimide resin.

**(54) ULTRASONIC MOTOR EQUIPPED WITH REDUCTION MECHANISM**

(11) 5-146177 (A) (43) 11.6.1993 (19) JP  
 (21) Appl. No. 3-331499 (22) 20.11.1991  
 (71) FUKOKU CO LTD (72) SHINJI SAGARA(1)  
 (51) Int. Cl<sup>8</sup>. H02N2/00

**PURPOSE:** To constitute an ultrasonic motor equipped with a reduction mechanism small by making use of a ball bearing, which supports a rotary shaft as the reduction mechanism of the ultrasonic motor.

**CONSTITUTION:** In an ultrasonic motor, the rotor 5, which rotates in a body with a rotor 3, is made in the shape of a cylinder, and it is supported rotatably with a ball bearing 7, and an output shaft 9 is pierced in the rotary shaft 5 so as to hold it rotatably, and one end of an output shaft 9 is coupled with the ball slip-out stopping member 7d of the ball bearing through a coupling material 11.



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